



Overview of Weather Data Maintained by ASD-400

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1.0 INTRODUCTION

The purpose of this document is to provide users with a reasonably detailed explanation of the National Climatic Data Center (NCDC) hourly surface weather data and the climatological data that ASD-400 maintains in the Operations Research Laboratory (ORLAB). This document provides the following:

- 1) Documentation of the applicable data fields that are extracted from the raw hourly surface data provided by the NCDC,
- 2) A companion, supplementary document to the updated *Performance Monitoring Analysis Capability V3.0 Addendum, December 2002*, and
- 3) An illustration with a description of the application of the historical climatological data (i.e., the *International Station Meteorological Climate Summary* information).

Each of these data can be very useful when conducting a wide range of operational assessments for investment analyses or general performance assessments for both the entire National Airspace System (NAS) or at individual airports. These weather data are accessible in the following ways: 1) the Graphical User Interface (GUI) using the Performance Analysis Monitoring Capability (PMAC) tool, 2) the processed databases/files through Visual FoxPro, and 3) the raw data and intermediate raw data (both ASCII text and DBMS format in Visual FoxPro). All these data are retrievable from any of the following three workstations: Falcon, Darwin, and Richter or the file server located in the ORLAB.

2.0 SURFACE WEATHER DATA

These data originate from the NCDC DATSAV2 and DATSAV3 data sets, which consists of hourly surface weather observations. There are very minor differences in the content within the DATSAV fields; however, the essential data is carried forward from both formats into the data sets that are in PMAC. Appendix A provides a breakdown of the data fields in the WXYMM.DBF files that are on the network data storage device, Tweedledee. A more detailed description of the fields in the data can be found in the *DATSAV2 Surface USAFETAC Climatic Database Users Handbook No. 4* (December 1986), and the *National Climatic Data Center Data Documentation for DATSAV3 Surface TD-9956* (April 20, 1999). The DATSAV2 format supports all data through September 1998, and DATSAV3 format supports all data beyond September 1998 through the present timeframe. The weather information presents airport-specific hourly surface observations plus any changed observations (specials) within the given hour for each day.

At this time, over seven complete years of hourly surface data, with the special intra-hourly observations, are available through PMAC. Over 300 NAS airports from 1995 through 1998, and almost 500 airports beginning in 1999 (see Appendix C) are stored in the Performance Information Module (Module 3, PMAC) under the weather menu. Access to several data sets is found under the Current Weather Data section. These data sets contain four views by airport and day/time: 1) occurrences of CAT I/II/III conditions, 2) non-precision approaches conditions (not yet implemented within the PMAC tool), 3) thunderstorm events, and 4) all weather conditions.

The DATSAV2 and DATSAV3 data contain both international and domestic surface weather observations collected and stored from several different sources. These sources include Automated Weather Observation Systems (AWOS), Automated Surface Observation Systems (ASOS), synoptic and airways, and Meteorological Routine Weather Reports (METAR). DATSAV2 and DATSAV3 refer to digital tape formats that contain the decoded observations. The observations are sent to the United States Air Force (USAF) Combat Climatology Center (AFCCC) where they are decoded and validated through quality control software before it is made available to the NCDC. ASD-400 purchases the raw data from the NCDC and consequently processes it into a usable format so analysts can easily access and retrieve the data.

2.1 Surface Weather Data Illustrations Through PMAC

One illustration of a file that can be retrieved in PMAC is the data set that portrays CAT I/II/III occurrences. Observations at Dallas/Ft. Worth (DFW) for February 15, 1995, from 1:00 a.m. through 9:00 a.m. local time are portrayed in Table 1 below.

Note: The very low ceiling and low visibility conditions throughout the day. Unless there are other causes besides adverse weather, the delays or flight times of aircraft arriving and departing DFW on a day with this type of weather are much more likely to be higher during the busy hours than on a good Visual Flight Rule (VFR) day.

Table 1: Weather – CAT I/II/III Extract

Airport	Description	Date	Time	Ceiling (feet)	Visibility (miles)
DFW	Dallas/Ft. Worth	950215	0100	200	2.98
DFW	Dallas/Ft. Worth	950215	0200	200	1.00
DFW	Dallas/Ft. Worth	950215	0201	200	0.75
DFW	Dallas/Ft. Worth	950215	0300	100	0.38
DFW	Dallas/Ft. Worth	950215	0400	0	0.25
DFW	Dallas/Ft. Worth	950215	0405	0	0.63
DFW	Dallas/Ft. Worth	950215	0418	200	0.75
DFW	Dallas/Ft. Worth	950215	0500	200	0.75
DFW	Dallas/Ft. Worth	950215	0506	200	1.25
DFW	Dallas/Ft. Worth	950215	0522	200	2.00
DFW	Dallas/Ft. Worth	950215	0600	200	1.50
DFW	Dallas/Ft. Worth	950215	0700	200	1.49
DFW	Dallas/Ft. Worth	950215	0800	200	1.50
DFW	Dallas/Ft. Worth	950215	0822	300	0.75
DFW	Dallas/Ft. Worth	950215	0900	300	1.50

This type of information is retrieved through the CAT I/II/III Conditions sub-menu under the Current Weather Data menu in PMAC's Performance Module as illustrated below in Figure 1.

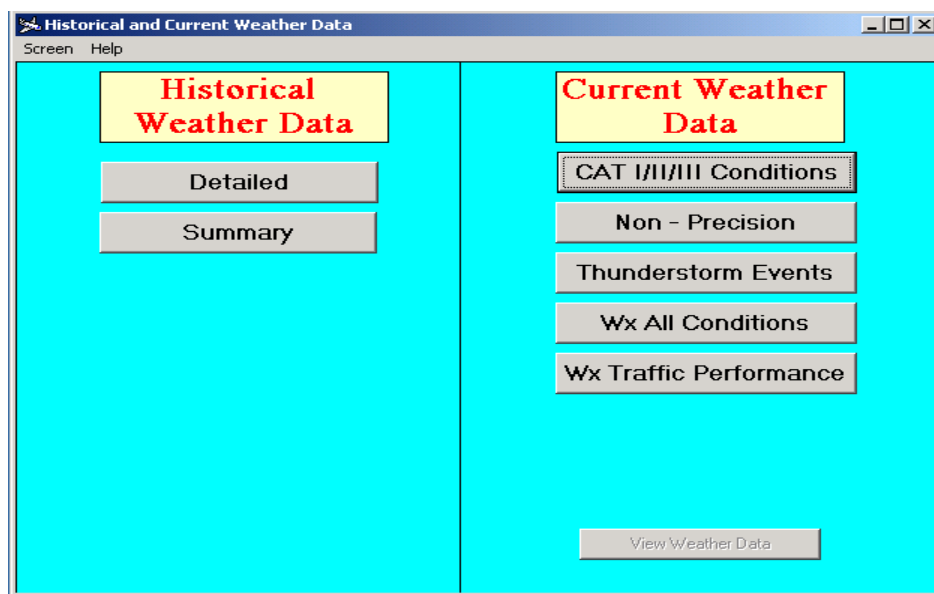


Figure 1: PMAC Weather Menu

An extract of some additional data fields at Atlanta (ATL) are listed below in Table 2. In this example, the wind information is included so an analyst can apply or infer different runway configurations by associating the ceiling and visibility information with the wind conditions.

Table 2: Weather – All Conditions Extract

Airport	Date	Time	Type rep	Obs Type	Elev (ft)	Stn Ctl	Wind Dir (deg)	Wind spd (knots/hour)	Wind Gust	Ceiling (feet)	Visibility (miles)
ATL	950101	0	2	2	315	9	160	3.6	9999	300	0.50
ATL	950101	100	2	7	315	9	190	4.5	9999	300	0.75
ATL	950101	133	3	2	315	9	190	6.6	9999	100	0.50
ATL	950101	200	2	2	315	9	170	4.5	9999	100	0.50
ATL	950101	205	3	2	315	9	200	4.7	9999	100	0.25
ATL	950101	300	2	2	315	9	210	4.7	9999	100	0.25
ATL	950101	400	2	2	315	9	200	4.9	9999	100	0.25
ATL	950101	512	3	2	315	9	320	5.9	9999	6900	2.00
ATL	950101	600	2	2	315	9	310	6.8	9999	6900	2.00
ATL	950101	606	3	2	315	9	220	6.8	9999	200	1.50
ATL	950101	700	2	7	315	9	270	7.3	9999	200	1.49
ATL	950101	800	2	2	315	9	270	5.2	9999	200	1.50
ATL	950101	900	2	2	315	9	270	5.1	9999	3300	1.50
ATL	950101	931	3	2	315	9	240	5	9999	3300	1.50
ATL	950101	1000	2	2	315	9	250	7.6	9999	3300	1.50
ATL	950101	1004	3	2	315	9	300	7.9	9999	6900	2.00
ATL	950101	1100	2	2	315	9	290	8.4	9999	2900	5.00

One useful feature (beginning in 1997) identifies precipitation codes (see Appendix B) associated with each observation. Typically, during good weather the weather observations are reported on an hourly basis. However, frequently for very small airports during good weather, there are gaps of several hours between records. For example, at 8:00 a.m. on a good VFR day when the ceiling is virtually unlimited at 20,000 feet and the visibility is eight miles, there may not be another

reportable observation until 3:00 p.m. When there are consequential weather events, the reporting observations are typically within the same hour (i.e., there could be an observation at 1:07 p.m., 1:22 p.m., and 1:35 p.m.). The majority of the precipitation codes in the present weather columns during VFR conditions are denoted as “999 – not reported.”

Ceiling and visibility are very important attributes that are necessary to consider when conducting operational analyses (see Table 3). They are defined as follows:

Ceiling – the height of the lowest cloud layer or obscuring phenomena when the sky cover is greater than 4/8s (between 5/8s and 7/8s) coverage broken or overcast (8/8s coverage) layer.

Visibility – the greatest distance that can be seen through at least half the horizon circle, which need not be continuous. Typically, visibility is reported in the NCDC as manual observations. Normally, automated stations determine visibility only at one point on the airport using a backscatter device.

Generic definitions of ceiling and visibility minimums are annotated below in Table 3. Note: For more granularity, ASD-400’s 2000 Airport Capacity Survey tool in MS Access 2000, which is housed in the ORLAB, provides minimum ceiling and visibility levels for visual, marginal visual, and instrument runway configurations. Inputs from approximately 100 surveys that were returned, were provided by air traffic personnel, i.e., tower specialists, operations managers and air traffic managers on an airport-specific basis. Questionable and incomplete responses were followed up with the respondents at the majority of the reported airports.

Table 3: Weather Condition

Weather Condition	Ceiling	Condition	Visibility
VFR	3,000 feet or more	And	5 miles or more
MVFR	Between 1,000 feet and 3,000 feet	Or	Between 3 and 5 miles
IFR	Below 1,000 feet	Or	Less than 3 miles
Non-Precision	>=500 feet	Or	<= 1 mile
Cat I	200 feet	Or	½ mile or 1,800 feet RVR
Cat II	100 feet	Or	1,200 feet RVR
Cat III	No decision height, visibility is the only limiting factor	Or	700 feet RVR

During inclement weather a wide range of codes may be reported. An illustration of an identifier of a thunderstorm at the airport is presented below in Table 4. For example, on 6/17/97, there were thunderstorms reported at ATL from 1515 (3:15 p.m.) to 1700 (5:00 p.m.) local time. The ceiling and visibility were within Instrument Flight Rule (IFR) minimums ranging from 1,300 to 2,100 feet with 1-6 mile visibilities, respectively. Thunderstorm codes 095 (thunderstorms, slight or moderate without hail) and 097 (thunderstorms, heavy without hail) were reported, along with rain codes 080 (rain showers, slight) and 081 (rain showers, moderate or heavy) during the day. Additionally, on 2/13/97, the conditions at 3:00 p.m. local time were reported as codes 005 and 017 (hazy, a thunderstorm, with no precipitation). Code 999 (reported in the Present Weath2 column) means that no weather observation was reported. Note the code 999 has been replaced with “-1” in the data sets from October 1998 and beyond, see Appendix A.

Table 4: Thunderstorm Events

Airport	Date	Local Time	GMT	Ceiling (feet)	Visibility (miles)	Present Weath1	Present Weath2
ATL	970617	1515	1915	2100	2.00	097	999
ATL	970617	1527	1927	2100	5.00	095	080
ATL	970617	1537	1937	2100	1.75	097	999
ATL	970617	1556	1956	1100	1.75	095	080
ATL	970617	1600	2000	1300	3.00	095	080
ATL	970617	1613	2013	1600	3.00	095	081
ATL	970617	1626	2026	1800	1.00	097	999
ATL	970617	1633	2033	1500	1.75	097	999
ATL	970617	1646	2046	1500	1.50	095	081
ATL	970617	1700	2100	1500	6.00	095	080
ATL	970713	1500	1900	6000	5.00	017	005

2.2 Potential Weather Data Applications

The following are sample applications of the surface weather data.

- 1) Provide assistance for evaluating the frequency of the transitions from IFR to VFR for different runway configurations at different airports. These minimums (ceiling and visibility) can either be applied generically (see Table 3), i.e., less than 1,000 foot ceiling or three mile visibility is IFR or as specified through the 2000 Airport Capacity Surveys at the busiest airports.
- 2) Provide airport capacity changes with respect to changes in the runway configurations ceiling, specifically visibility and crosswinds. The airport capacities are applied to models such as the National Airspace System Performance Analysis Capability (NASPAC) and Detailed Policy Assessment Tool (DPAT). ASD-400 and the FAATC have and will continue to apply these models in their analyses.
- 3) Identification of thunderstorm and lightning events at the airports.
- 4) Identification of different levels and frequencies of fog and haze. Haze combined with smoke greatly reduces visibility.
- 5) Identification of different levels of precipitation; includes drizzle, freezing rain, rain showers, snow, ice pellets, snow showers, etc.

2.3 Surface Weather Files

The user can retrieve processed data in two ways. The first way is by retrieving the detailed data sets that are stored on the network data storage device, Tweedledee. The exceptions are the raw files provided by the NCDC to ASD-400, which are available upon request. The directory path to access each of the files from the three workstations Richter, Darwin, or Falcon is Jupiter/Public/Tweedledee/Drive1/PMAC/Local or Shared within the Network Neighborhood. The primary surface weather file names in the PMAC are listed below in Table 5.

Table 5: Surface Weather File Names

Type	Location/Name
Raw	Available Upon Request
Monthly	WXYMM.DBF
Non- Precision	WXNPYY.DBF
CAT I/II/III	WXCATYY.DBF
Thunderstorms	WXTSTMYY.DBF
Weather Codes (Manual)/(Automated)	WXCODS.DBF/WXCODESA.DBF
Station List (master list of available airports)	Global <i>Station_</i> List.txt

Once these files are retrieved, they can easily be converted into different formats in Excel, text, or delimited text. The second way, as previously illustrated in Section 2.1 (where the files are transparent to the user), is by retrieving the data through the PMAC interface. For example, when the user selects the WX All Conditions option in Figure 1, any airport on the pull-down menu can be selected. Six columns presented from this query are: airport code, airport name, date, local time, ceiling, and visibility. The data is queried by year/month and airport, and can easily be saved by hitting Save As to Excel, DBASE (which works for FoxPro files), or Access formats. Similarly, menu options CAT I/II/III, Non-Precision and Thunderstorm Events can also be selected.

3.0 CLIMATOLOGICAL DATA

In addition to the surface data, an analyst can retrieve the historical climatological data in the Historical Weather section through the HISTDETL.DBF file. This file is an aggregation of annual summaries at 179 airports. More refined data and a greater range of weather data can be directly retrieved from the CD-ROM, *International Station Meteorological Climate Summary V4.0, September 1996*, which is housed in the ORLAB. This summary data provides breakdown by month and in three-hour time increments.

An example of this climatological data for Minneapolis St. Paul (MSP) is illustrated below in Table 6. The values in the table represent the average annual weather based on over 40+ years of collected observations.

The steps used to access the climatological data from the CD-ROM are as follows:

- 1) Go to the ISMCS directory on the CD-ROM drive, and then hit the Enter key. This will enable the user to retrieve most towered airports.
- 2) After the world map is displayed, move the white rectangle to the region of the airports of interest with the Shift Arrow key.
- 3) Hit the F4 SELECT key, scroll to the 7-call sign, and hit the Enter key.
- 4) Enter a call sign within the brackets that follow the "Speedsearch on Collision" notation. The first character for U.S. airports must start with K. The next three characters represent the three-character airport code. After the K*** airport code is entered, hit the Enter key.
- 5) Next, go to the second lowest line in the bottom right corner and select "CEILING and VSBY by Hr-Month" option.

Several options come up which include the annual summary (ANN ALL LST), monthly summary, (DEC ALL LST), and monthly/time of day summary (DEC 0900 LST). Select the option most relevant to the analysis. The monthly files in three-hour increments are very valuable since there are very large differences in the weather conditions by time of day, i.e., specifically an instrument configuration during the morning and afternoon hours. For example, LGA at 7:00 a.m., the likelihood of the ceiling or visibility being less than ½ mile or 200 feet is 2.2%, and at 4:00 p.m., it is .1%.

Table 6: Climatological Data (Annual Average)

VSBY (miles)	>=10	>=6	>=5	>=4	>=3	>=2.5	>=2	>=1.5	>=1.25	>=1	>=3/4	>=5/8	>=1/2	>=5/16	>=1.4	>=0
Ceiling (00 ft)																
Unl	49	52.2	52.6	53	53.3	53.5	53.5	53.6	53.6	53.6	53.7	53.7	53.7	53.7	53.7	53.8
>=200	52	55.4	56	56.4	56.4	56.8	56.8	57	57	57.1	57.1	57.1	57.1	57.1	57.1	57.2
>=160	52.6	56.1	56.6	57	57.3	57.5	57.6	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.8	57.8
>=120	56.3	60.1	60.7	61.2	61.5	61.6	61.8	61.8	61.8	61.9	61.9	61.9	61.9	61.9	61.9	62
>=100	59.1	63.3	63.9	64.4	64.8	65	65.1	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.3	65.3
>=80	61.7	66.3	67	67.5	67.9	68.1	68.2	68.3	68.3	68.3	68.4	68.4	68.4	68.4	68.4	68.5
>=60	64.8	69.8	70.6	71.2	71.7	71.9	72	72.1	72.1	72.2	72.2	72.2	72.2	72.2	72.2	72.3
>=50	66.1	71.4	72.3	72.9	73.4	73.6	73.8	73.9	73.9	74	74	74	74	74	74	74.1
>=40	68.4	74.1	75	75.8	76.2	76.5	76.7	76.7	76.8	76.8	76.9	76.9	76.9	77	77	77
>=30	71.1	77.2	78.3	79.1	79.7	80	80.2	80.4	80.4	80.4	80.5	80.5	80.5	80.5	80.5	80.6
>=25	72.9	79.4	80.6	81.5	82.1	82.5	82.8	82.9	82.9	83	83	83	83.1	83.1	83.1	83.1
>=20	74.9	81.9	83.1	84.1	84.8	85.3	85.6	85.8	85.8	85.9	86	86	86	86	86	86.1
>=18	75.7	82.9	84.2	85.3	86	86.6	86.9	87.1	87.2	87.3	87.3	87.3	87.3	87.4	87.4	87.4
>=15	76.8	84.5	85.9	87.1	87.9	88.5	89	89.3	89.3	89.4	89.5	89.5	89.5	89.5	89.6	89.6
>=12	77.9	86.3	87.9	89.2	90.2	90.9	91.4	91.8	91.8	92	92.1	92.1	92.1	92.1	92.1	92.2
>=10	78.5	87.3	89	90.5	91.6	92.4	93.1	93.5	93.6	93.9	94	94	94	94.1	94.1	94.1
>=9	78.7	87.7	89.5	91.1	92.3	93.1	93.9	94.4	94.4	94.7	94.9	94.9	94.9	94.9	94.9	95
>=8	78.8	88.1	90	91.6	92.9	93.9	94.6	95.2	95.3	95.6	95.8	95.9	95.9	95.9	95.9	95.9
>=7	78.9	88.4	90.4	92.1	93.5	94.6	95.4	96	96.1	96.5	96.7	96.7	96.8	96.8	96.8	96.9
>=6	78.9	88.5	90.6	92.5	94	95.1	96.1	96.8	96.9	96.8	96.9	97.5	97.6	97.6	97.6	97.7
>=5	79	88.6	90.7	92.7	94.4	95.5	96.5	97.3	97.4	97.9	98.2	98.2	98.3	98.3	98.4	98.4
>=4	79	88.6	90.7	92.7	94.4	95.7	96.9	97.8	97.9	98.4	98.8	98.8	98.9	98.9	99	99
>=3	79	88.6	90.7	92.7	94.4	95.8	97	98	98.4	98.8	99.1	99.1	99.3	99.3	99.4	99.5
>=2	79	88.6	90.7	92.7	94.4	95.8	97.1	98	98.8	99.1	99.3	99.5	99.6	99.7	99.7	99.7
>=1	79	88.6	90.7	92.7	94.4	95.8	97.1	98	98.9	99.3	99.3	99.6	99.6	99.6	99.8	99.9
>=0	79	88.6	90.7	92.7	94.4	95.8	97.1	98	98.9	99.3	99.3	99.6	99.6	99.6	99.8	100

The data/two events can be interpreted as follows:

- Event A: the Ceiling is reported at a certain altitude, e.g., 1,000 feet.
- Event B: the Visibility is reported at a certain altitude, e.g., three miles.

From the table, at MSP, the probability of Event A and Event B occurring at >=1,000 feet ceiling AND >=three-mile visibility is 91.6%; conversely, the probability of either the ceiling being <1,000 feet OR visibility <three miles is the inverse, 8.4% (100%-91.6%). Similarly, the probability of the ceiling being >=1,000 feet AND the visibility >=ten miles is 78.5%. This means that the

probability of conditions having at least a 1,000 foot ceiling with any range of visibility (between three and ten miles) is between 78.5% and 91.6% of the time (e.g., the likelihood of at least a 1,000 foot ceiling AND at least a five-mile visibility instead of a 1,000 foot ceiling or a three-mile visibility is reduced by 2.6 percentage points from 91.6% to 89%).

When the table is read from the lower right hand side, it is obvious that the probability of the ceiling being ≥ 0 AND visibility $\geq 1/2$ mile is 99.6%. Therefore, it can be inferred that 0.4% of the time the visibility is between 0 and $1/2$ mile which translates to CAT I condition or below.

4.0 NEXT STEPS

ASD-400 will collect and process surface weather data on an ongoing basis. The data tables will be migrated into an ORACLE 9i environment in FY03. Multiple views will be built so a wide range of queries can be quickly retrieved.

Convective weather, which has a major impact on air traffic operations, needs to be collected and processed by ASD-400 on a recurring basis. Working arrangements for data such as lightning-strikes data and raw thunderstorm wind data must be made with organizations such as MIT Lincoln Lab and the NCDC. There is a large amount of raw thunderstorm and wind data at NCDC that may be beneficial and should be explored. Several web sites such as the NCDC site, <http://lwf.ncdc.noaa.gov/oa/ncdc.html> and NEXRAD National Mosaic Reflectivity Images data at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwNexrad~Images2> is available to assist with the analyses.

Appendix A: Data Descriptions

This section presents the field descriptions of both the DATSAV2 (the format through September 1998) and DATSAV3 (the format from October 1998 through present) layouts. Note: Several fields from the Raw and Raw-Intermediate files denoted in Table 5 (Section 2.3) are not included in the files presented in this table. Consequently, the data filtered into the WXYMM.DBF files in PMAC contain only the fields annotated below. The vast majority of the data needs are satisfied through a subset of the fields, which are carried forward in PMAC. Several of the data fields that are in the Raw or Raw-Intermediate data annotated in Table 5 (Section 2.3) can be very difficult and tedious to interpret or understand unless an experienced meteorologist is available to provide assistance to the analyses. Support can also be provided by ASD-100/SETA. Nevertheless, if there is a need for more in-depth weather impact analysis, then additional fields such as snow depth, dew point, dry bulb temperature, etc., are available by request to ASD-400 in an ASCII text format, by accessing the Raw and Raw-Intermediate files. Each field name in the WXYMM.DBF files, with a short description, is presented below in Table A-1.

Table A-1: Formats of Various Surface Weather Files in PMAC

Field	Data Type	Description	Field Len.	PMAC ¹ - DSAV3	PMAC ² - DSAV2	DSAV2
Station	C	The surface reporting station from global-station list	6	X	X	X
Airport	C	The airport code	4	X	X	X
Wdate	C	The date of the geophysical point observation	6/8	X	X	X
Wtime	C	The time of the geophysical point observation (local time)	4	X	X	X
Gmt	C	The time of the geophysical point observation (Universal Time Code)	4	X	X	X
Lat	C	The latitude	7	X		
Long	C	The longitude	7	X		
Reporttype or Obtype	C	Code that denotes the type of geophysical surface observation. Codes include 01=synoptic, 02= airways, 03=METAR, 04=AERO, 05=SMARS, 06=automatic, 07=Synoptic-airways merged.	5	X	X	X
Statelev	C	Elevation at the station	5	X	X	X
Stnctl	C	Indicates what organization controls the station: 1=Air Force or Army, 2=Navy Marines or Coast Guard, 3=NOAA, 4=FAA, 5=Other, 9=Missing	1		X	X
*Winddirect	C	The angle measured in a clockwise direction between the north, and direction that wind is blowing - min 001, max 360 angular degrees	3	X	X	X

* Missing or Null data denoted by "-1"

¹ October 1998 to present used updated DATSAV3 format and carried 38 columns forward using YYYYMMDD in wdate.

² January 1996 through September 1998 used DATSAV2 with 42 columns, January 1998 through September 1998 with 43 columns, and wdate is in MMDDYY format.

³ January 1995 through December 1996 used DATSAV2 and carried 24 columns forward.

Table A-1: Formats of Various Surface Weather Files in PMAC (Cont'd)

Field	Data Type	Description	Field. Len.	PMAC ¹ - DSAV3	DSAV2	PMAC ³ - DSAV2
Winddirq	C	Denotes quality of observation 0=no check, 1=good, 2=suspect, 3=erroneous, 9=missing	1	X		
Windobst	C	Wind observation type code Cecil, N: normal, Q: squall, V: variable, 9=missing	1	X		
*Windspeed	N	Rate of horizontal travel of air past a fixed point - min 0.0 max 90.0 (converted to knots per hour).	9.3	X	X	X
Windspeedq	C	Code that denotes a quality status of a reported wind observation speed rate, observation 0=no check, 1=good, 2=suspect, 3=erroneous, 9=missing	1	X		
*Windgust	C	DATSAV2: The rate of speed of a wind gust ranges from 50 to 1,100 (meters per second with a scaling factor of 10). DATSAV3: The rate of speed of a wind gust ranges from 5 to 110 (meters per second).	4	X	X	X
Windgus_Q	C	Quality of windgust code. Codes include 0=no check, 1=good, 2=suspect, 3=erroneous, and 9=missing.	1	X		
Cig		Height of cloud ceiling in meters, conversion from Code 1677 table		X	X	X
*Cigfeet	N	Conversion to feet from meters from Cig record	5.0	X	X	X
*Cigmeter	N	Original reported record - ranges from 0 meters to 22,000 meters, same as CIG in DATSAV2 format	5.0	X	X	X
CeilingQ	C	Denotes a quality status of a reported ceiling height either, 0=no check, 1=good, 2=suspect, 3=erroneous, 9=missing	1	X		
*CeilingD	N	Ceiling determination code. Denotes method to determine the ceiling.	1	X		
COR	N	An indicator showing whether observation was retransmitted as a corrected observation, 0=not a corrected report, 1=corrected report, 9=unknown	1			X
*Vsby_Meter	N	Ranges from 0 to 16000 meters (10 miles), null=missing	6	X		
*Vsby	N	Conversion to miles of the vsby_meter record, null=missing	6.3	X		X
Vsbyq	C	Quality of visibility, 0 = no check, 1=good, 2=suspect, 3=erroneous, 9=missing	1	X		
CV		Visibility indicator: 0=non-variable report, 1=variable report, 9=missing or non-airways/METAR observation	4		X	X

* Missing or Null data denoted by "-1"

¹ October 1998 to present used updated DATSAV3 format and carried 38 columns forward using YYYYMMDD in wdate.

² January 1996 through September 1998 used DATSAV2 with 42 columns, January 1998 through September 1998 with 43 columns, and wdate is in MMDDYY format.

³ January 1995 through December 1996 used DATSAV2 and carried 24 columns forward.

Table A-1: Formats of Various Surface Weather Files in PMAC (Cont'd)

Field	Data Type	Description	Field. Len.	PMAC ¹ - DSAV3	DSAV2	PMAC ³ - DSAV2
Past_TW		Applicable period of time in hours (000-999) covered by reported past weather			X	X
Past_W1 thru W2	N	First and second past weather reports (00-099) 999=missing			X	X
*Pres_WW	C	Manual occurrence identifier – 1 st weather reported, reserved for synoptic and AERO reports.	3	X	X	X
*Pres_WW1	C	Manual occurrence identifier – 2 nd weather reported, includes METAR reports.	3	X	X	X
*Pres_WW2	C	Manual occurrence identifier – 3 rd weather observation reported.	3	X	X	X
*Pres_WW3	C	Manual occurrence identifier – 4 th weather observation reported.	3	X	X	X
*Pres_WACC	C	Present weather – automatic atmospheric condition code	3	X		X
Pres_WQCQ through Pres_WQCQ1	C	Quality status of reported weather observations from automated station; 0=no check, 1=Good, 2=Suspect, 3=Erroneous, 9=missing	1	X		
*Precip_RR1 through Precip_RR2	N	The amount of precipitation in inches. Before 12/99, amount in millimeters.	5.3	X	X	
*Precip_TR1 thru TR2; TR3 and TR4 in DATSAV2	N	Time period of precipitation ranging from 0 to 48 hours ending at time of observation, null=missing	2	X	X	
*Precip_RR1 thru RR2; RR3 and RR4 in DATSAV2	N	DATSAV2: Amount of precipitation in tenths of millimeters (e.g., 25.5 mm stored as 255) DATSAV3: Amount of precipitation in millimeters (e.g., 25.5 mm stored as 25.5)	5.3	X	X	
*Precip_C1	N	The quantity of time over which liquid precipitation was measured, 9=missing	3	X		X
Bog_Pre_FR		0= reported amount of precipitation and reported weather agree or 1=precipitation missing or not reported	1		X	
Bog_Pre-RR		Bogus precipitation amount in whole millimeters (0-9998) for a three-hour synoptic period	4		X	
*HAILS1	N	The diameter of the largest hailstone observed (range 0-20 in cm) converted to inches	3	X		
*RVRA	N	The angle as measured in degrees from magnetic north to the runway along which the visibility is observed	3	X		X

* Missing or Null data denoted by “-1”

¹ October 1998 to present used updated DATSAV3 format and carried 38 columns forward using YYYYMMDD in wdate.

² January 1996 through September 1998 used DATSAV2 with 42 columns, January 1998 through September 1998 with 43 columns, and wdate is in MMDDYY format.

³ January 1995 through December 1996 used DATSAV2 and carried 24 columns forward.

Table A-1: Formats of Various Surface Weather Files in PMAC (Cont'd)

Field	Data Type	Description	Field. Len.	PMAC ¹ - DSAV3	DSAV2	PMAC ³ - DSAV2
*RVR_RUN	C	The code that denotes the left, right, or center runway as the one to which the visibility applies, null=missing	3	X		X
*RVR_VLS	N	The dimension of the horiz distance that can be seen along the runway range is 0-5000 in feet, null=missing	5	X		X
DryBulbTemp		Stored in tenths of degrees Kelvin (e.g. 284.4 stored as 2844) 999=missing	4		X	X
DewPtTemp		Same as dry bulb temp description	4		X	X
SeaVLPRSR		Sea level pressure, stored in tenths of millibats (e.g., 1012.2 stored as 10122) 99999=missing	5		X	X
Altset		Stored in hundredths of inches (e.g., 29.32 stored as 2932) 999=missing	4		X	X
RVR_RUN or (RUNWAYNUM)		Runway visual range in whole meters (0000-9998) 9999=missing	2/3	X		X
RVR or RVRA		The angle as measured from magnetic north to the runway to which the visibility is observed	3/4	X		X

* Missing or Null data denoted by “-1”

¹ October 1998 to present used updated DATSAV3 format and carried 38 columns forward using YYYYMMDD in wdate.

² January 1996 through September 1998 used DATSAV2 with 42 columns, January 1998 through September 1998 with 43 columns, and wdate is in MMDDYY format.

³ January 1995 through December 1996 used DATSAV2 and carried 24 columns forward.

Appendix B: Weather Codes (Manual and Automated Observations)⁴

This section presents both manual (Table B-1) and automated (Table B-2) weather code observations.

Table B-1: Manual Observations (Wxcodes.dbf)

Code	Condition
000	Clear
001	Clouds dissolving
002	Sky state unchanged
003	Clouds developing
004	Smoke reduced visibility
005	Hazy
006	Dust in air not raised by wind
007	Dust/sand raised by wind
008	Dust whirls
009	Dust storm or sandstorm
010	Misty
011	Patchy fog or ice fog
012	Continuous fog or ice fog
013	Lightning, no thunder
014	Precip in sight, not reaching the ground or surface of sea
015	> 5km Precip, w/surface
016	Precip w/in sight, not station
017	Thunderstorm, but no precipitation
018	Squalls at or within sight of the station
019	Funnel cloud(s) at or within the station
020	Drizzle (not freezing) or snow grains
021	Rain (not freezing)
022	Snow
023	Rain and snow or ice pellets
024	Freezing rain
025	Shower(s) of rain
026	Shower(s) of snow
027	Shower(s) of hail
028	Fog or ice fog
029	Thunderstorm
030	Slight or mod. dust or sandstorm has decreased
031	Slight or mod. dust or sandst, no apprec change
032	Slight or mod. dust or sstorm begun or has increased

Code	Condition
033	Severe dust storm or sandstorm has decreased
034	Severe dust storm or sstorm, no apprec change
035	Severe dust storm or sstorm or haze increased
036	Slight or moderate drifting snow, generally low
037	Slight or moderate blowing snow
038	Slight or moderate blowing snow, generally high
039	Heavy blowing snow, generally high
040	Fog or ice fog at the time of observation
041	Fog or ice fog in patches
042	Fog or ice fog, sky visible has become thinner
044	Fog or ice fog, sky visible, no appreciable change
045	Fog or ice fog, sky invisible, no appreciable change
046	Fog or ice fog, sky visible has begun or has become thicker
047	Fog or ice fog, sky invisible has begun or has become thicker
048	Fog, depositing rime, sky visible
049	Fog, depositing rime, sky invisible
050	Drizzle, not freezing, intermittent: slight
051	Drizzle, not freezing, continuous: slight
052	Drizzle, not freezing, intermittent: moderate
053	Drizzle, not freezing, continuous: moderate
054	Drizzle, not freezing, intermittent: heavy
055	Drizzle, not freezing, continuous: heavy
056	Drizzle, freezing, slight
057	Drizzle, freezing, moderate or heavy
058	Drizzle and rain, slight
059	Drizzle and rain, moderate or heavy
060	Rain, not freezing, intermittent: slight
061	Rain, not freezing, continuous: slight
062	Rain, not freezing, intermittent: moderate
063	Rain, not freezing, continuous: moderate
064	Rain, not freezing, intermittent: heavy

⁴ Note: These codes denote a specific type of weather manually observed.

Note: In the WXYMM.DBF files maintained in PMAC, the formats are slightly different; however, the codes are identical. From 10/98 and beyond, the fields are two characters, before 10/98, they are three characters. Corresponds to Pres_WW through Pres_WW3.

Table B-1: Manual Observations (Cont'd)

Code	Condition
065	Rain, not freezing, continuous: heavy
066	Rain, freezing, slight
067	Rain, freezing, moderate or heavy
068	Rain or drizzle and snow, slight
069	Rain or drizzle and snow, moderate or heavy
070	Intermittent fall of snowflakes: slight
071	Continuous fall of snowflakes: slight
072	Intermittent fall of snowflakes: moderate
073	Continuous fall of snowflakes: moderate
074	Intermittent fall of snowflakes: heavy
075	Continuous fall of snowflakes: heavy
076	Diamond dust
077	Snow grain
078	Isolated star-like snow crystals
079	Ice pellets
080	Rain shower(s), slight
081	Rain shower(s), moderate or heavy
082	Rain shower(s), violent
083	Shower(s) of rain and snow mixed, slight

Code	Condition
084	Shower(s) of rain and snow mixed, mod or heavy
086	Snow shower(s), moderate or heavy
087	Shower(s) of snow pellets or ice pellets: slight
088	Rain or rain and snow mixed: mod or heavy
089	Shower(s) of hail, with or without rain or rain and snow mixed: slight
090	Shower(s) of hail, with or without rain or rain and snow mixed: moderate or heavy
091	Slight rain
092	Moderate or heavy rain
093	Slight snow, or rain and snow mixed or hail
094	Moderate or heavy snow, or rain and snow mixed or hail
095	Thunderstorm, slight or moderate, without hail
096	Thunderstorm, slight or moderate, with hail
097	Thunderstorm, heavy, without hail
098	Thunderstorm combined with dust storm or sandstorm
099	Thunderstorm, heavy, with hail
Blank	Not reported

Note: In the WXYMM.DBF files maintained in PMAC, the formats are slightly different; however, the codes are identical. From 10/98 and beyond, the fields are two characters, before 10/98, they are three characters.

Table B-2: Automated Observations (Wxcodesa.dbf)

Code	Condition
020	Fog
021	Precipitation
022	Drizzle (not freezing) or snow grains
023	Rain (not freezing)
024	Snow
025	Freezing drizzle or freezing rain
026	Thunderstorm (with or without precipitation)
027	Blowing or drifting snow or sand
028	Blowing or drifting snow or sand, visibility equal to or greater than 1 km
029	Blowing or drifting snow or sand, visibility less than 1 km
030	Fog
031	Fog or ice fog in patches
032	Fog or ice fog, has become thinner during the past hour
033	Fog or ice fog, no appreciable change during the past hour
034	Fog or ice fog, has begun or become thicker during the past hour
035	Fog, depositing rime
040	Precipitation
041	Precipitation, slight or moderate
042	Precipitation, heavy
043	Liquid precipitation, slight or moderate
044	Liquid precipitation, heavy
045	Solid precipitation, slight or moderate
046	Solid precipitation, heavy
047	Freezing precipitation, slight or moderate
048	Freezing precipitation, heavy
050	Drizzle
051	Drizzle, not freezing, slight
052	Drizzle, not freezing, moderate
053	Drizzle, not freezing, heavy
054	Drizzle, freezing, slight
055	Drizzle, freezing, moderate
056	Drizzle, freezing, heavy

Code	Condition
057	Drizzle and rain, slight
058	Drizzle and rain, moderate or heavy
060	Rain
061	Rain, not freezing, slight
062	Rain, not freezing, moderate
063	Rain, not freezing, heavy
064	Rain, freezing, slight
065	Rain, freezing, moderate
066	Rain, freezing, heavy
067	Rain or drizzle and snow, slight
068	Rain or drizzle and snow, moderate or heavy
070	Snow
071	Snow, slight
072	Snow, moderate
073	Snow, heavy
074	Ice pellets, slight
080	Showers or intermittent precipitation
081	Rain showers or intermittent rain, slight
082	Rain showers or intermittent rain, moderate
083	Rain showers or intermittent rain, heavy
084	Rain showers or intermittent rain, violent
085	Snow showers or intermittent rain, slight
086	Snow showers or intermittent rain, moderate
087	Snow showers or intermittent rain, heavy
090	Thunderstorm
091	Thunderstorm, slight or moderate, with no precipitation
092	Thunderstorm, slight or moderate, with rain showers and/or snow showers
093	Thunderstorm, slight or moderate, with hail
094	Thunderstorm, heavy, with no precipitation
095	Thunderstorm, heavy, with rain showers and/or snow
096	Thunderstorm, heavy, with hail
099	Tornado
Blank	Not Reported

Appendix C: List of Airports with Surface Weather Data

This section presents a list of airports that have surface weather data for each month.

Table C-1: Airports

Code	Airport	Code	Airport
3B2	MARSHFIELD AIRPORT MA	AVL	ASHEVILLE REGIONAL
ABE	ALLENTOWN-BETHLEHEM PA	AVP	WILKES-BARRE/SCRANTO
ABI	ABILENE MUNICIPAL TX	AZO	KALAMAZOO INTL ARPT MI
ABQ	ALBUQUERQUE INTL NM	BAF	BARNES MUNI
ABY	SOUTHWEST GEORGIA RE	BED	HANSCOM FLD/BEDFORD MA
ACK	NANTUCKET MEMORIAL & MA	BFI	SEATTLE/BOEING FLD WA
ACT	WACO REGIONAL	BFL	BAKERSFIELD/MEADOWS CA
ACV	ARCATA/EUREKA ARPT CA	BFM	MOBILE DOWNTOWN AIRP
ACY	ATLANTIC CITY INTL NJ	BGM	BINGHAMTON REGIONAL
ADM	ARDMORE MUNI	BGR	BANGOR INTL ARPT & ME
ADQ	KODIAK	BHM	BIRMINGHAM MUNI AL
ADS	DALLAS/ADDISON ARPT TX	BIL	BILLINGS/LOGAN INTL MT
ADW	ANDREWS AFB MD	BIS	BISMARCK MUNI
AFW	FORT WORTH/ALLIANCE TX	BJC	BROOMFIELD/JEFFCO CO
AGC	PITTSBURGH/ALLEGHEN PA	BKF	BUCKLEY ANGB/DENVER CO
AGS	BUSH FIELD	BKL	BURKE LAKEFRONT
AHN	ATHENS/BEN EPPS	BLI	BELLINGHAM INTL
AKN	KING SALMON	BLM	BELMAR-FARMDALE NJ
ALB	ALBANY COUNTY ARPT NY	BLV	SCOTT AFB
ALN	ALTON/ST LOUIS RGNL IL	BMG	MONROE COUNTY
ALO	WATERLOO MUNI	BMI	BLOOMINGTON/NORMAL
ALW	WALLA WALLA REGIONAL	BNA	NASHVILLE METRO TN
AMA	AMARILLO INTL	BOI	BOISE MUNICIPAL ID
ANC	ANCHORAGE INTL	BOS	BOSTON/LOGAN INTL & MA
ANC	ANCHORAGE INTL ARPT AK	BPT	JEFFERSON COUNTY
ANE	MINNEAPOLIS/BLAINE MN	BRO	BROWNSVILLE INTL TX
APA	DENVER/CENTENNIAL CO	BTL	W K KELLOGG
APC	NAPA CO. AIRPORT CA	BTR	BATON ROUGE/RYAN LA
APF	NAPLES MUNI	BTV	BURLINGTON INTL VT
ARA	ACADIANA REGIONAL	BUF	BUFFALO INTL ARPT NY
ARB	ANN ARBOR MUNICIPAL MI	BUR	BURBANK/GLENDALE CA
ARR	AURORA MUNICIPAL IL	BVI	BEAVER FALLS ARPT PA
ASE	ASPEN-PITKIN CO/SARD	BVX	BATESVILLE (AWOS) AR
ASG	SPRINGDALE MUNI AR	BVY	BEVERLY MUNICIPAL MA
ASH	NASHUA/BOIRE FIELD NH	BWI	BALTIMORE/WASH INTL MD
ATL	ATLANTA INTL ARPT GA	CAE	COLUMBIA METRO SC
ATW	OUTAGAMIE COUNTY	CAK	AKRON-CANTON RGNL OH
AUS	AUSTIN/MUELLER MUNI TX	CBM	COLUMBUS AFB MS

Table C-1: Airports (Cont'd)

Code	Airport
CCR	CONCORD/BUCHANAN CA
CDW	CALDWELL/ESSEX CO. NJ
CGF	CUYAHOGA COUNTY
CGI	CAPE GIRARDEAU REGIO
CGX	MERRILL C MEIGS
CHA	CHATTANOOGA/LOVELL TN
CHO	CHARLOTTESVILLE VA
CHS	CHARLESTOWN MUNI SC
CIC	CHICO MUNI
CID	CEDAR RAPIDS MUNI
CKB	BENEDUM
CLE	CLEVELAND/HOPKINS OH
CLL	EASTERWOOD FIELD
CLT	CHARLOTTE/DOUGLAS NC
CMA	CAMARILLO (AWOS) CA
CMH	PORT COLUMBUS INTL OH
CMI	CHAMPAIGN/URBANA IL
CNO	CHINO AIRPORT CA
COE	COEUR D'ALENE (AWOS) ID
COS	COLORADO SPRINGS CO
COU	COLUMBIA REGIONAL
CPR	NATRONA COUNTY INTL
CPS	CAHOKIA/ST. LOUIS IL
CRE	GRAND STRAND
CRG	JACKSONVILLE/CRAIG FL
CRP	CORPUS CHRISTI INTL TX
CRQ	CARLSBAD/PALOMAR CA
CRW	CHARLESTON/KANAWHA WV
CSG	COLUMBUS METROPOLITA
CSM	CLINTON-SHERMAN
CVG	CINCINNATI/COVINGTO KY
CWA	CENTRAL WISCONSIN
CXY	CAPITAL CITY
CYS	CHEYENNE
DAB	DAYTONA BEACH RGNL FL
DAL	DALLAS/LOVE FIELD & TX
DAY	DAYTON/JAMES M COX OH
DBQ	DUBUQUE REGIONAL
DCA	WASHINGTON/NATIONAL VA
DEC	DECATUR
DEN	DENVER INTNL ARPT CO
DET	DETROIT CITY ARPT MI
DFW	DALLAS/FT WORTH TX
DHN	DOTHAN AIRPORT

Code	Airport
DLH	DULUTH INTL
DOV	DOVER AFB DE
DPA	W. CHICAGO/DU PAGE IL
DSM	DES MOINES INTL IA
DTN	SHREVEPORT DOWNTOWN
DTO	DENTON (ASOS) TX
DTW	DETROIT METRO MI
DVT	DEER VALLEY/PHOENIX AZ
DVX	DELAWARE AIRPARK
DWH	HOUSTON/D.W. HOOKS TX
DXR	DANBURY MUNICIPAL CT
ECG	ELIZABETH CITY (CGS) NC
EDW	EDWARDS AFB
EFD	HOUSTON/ELLINGTON TX
EGE	EAGLE COUNTY REGIONA
EKO	ELKO MUNI-J.C. HARRI
ELM	ELMIRA/CORNING REGIO
ELP	EL PASO INTL ARPT TX
EMT	EL MONTE & CA
ENA	KENAI MUNI
END	VANCE AFB/ENID OK
ERI	ERIE INTL
ESF	ALEXANDRIA ESLER REG
EUG	EUGENE/MAHLON SWEET OR
EVV	EVANSVILLE REGIONAL
EWB	NEW BEDFORD REGIONAL
EWR	NEWARK INTL AIRPORT NJ
EYW	KEY WEST INTL ARPT FL
FAI	FAIRBANKS INTL
FAR	FARGO/HECTOR FIELD ND
FAT	FRESNO AIR TERMINAL CA
FAY	FAYETTEVILLE REGIONA
FCM	MINNEAPOLIS/FLY CLD MN
FFZ	MESA/FALCON FIELD AZ
FLG	FLAGSTAFF PULLIAM
FLL	FT LAUDERDALE/HOLLY FL
FLO	FLORENCE REGIONAL
FMN	FARMINGTON REGIONAL NM
FMY	FORT MYERS/PAGE FLD FL
FNL	FORT COLLINS (AWOS) CO
FNT	FLINT/BISHOP INTL MI
FOE	FORBES FIELD
FOK	WESTHAMPTON BEACH NY
FPR	FT PIERCE/ST LUCIE FL

Table C-1: Airports (Cont'd)

Code	Airport
FRG	FARMINGDALE/REPUBLIC NY
FSD	SIOUX FALLS/FOSS SD
FSM	FORT SMITH REGIONAL
FTW	FORT WORTH/MEACHAM TX
FTY	ATLANTA/FULTON CO. GA
FUL	FULLERTON MUNICIPAL CA
FWA	FORT WAYNE/BAER FLD IN
FXE	FORT LAUDERDALE FL
FYV	DRAKE FIELD
GCN	GRAND CANYON PARK AZ
GEG	SPOKANE INTL ARPT WA
GFK	GRAND FORKS INTL ND
GGG	GREGG COUNTY
GJT	WALKER FIELD
GLH	GREENVILLE MUNI
GMU	GREENVILLE DOWNTOWN
GNV	GAINESVILLE REGIONAL
GON	GROTON-NEW LONDON
GPT	GULFPORT-BILOXI MS
GRB	AUSTIN STRAUBEL INTE
GRI	CENTRAL NEBRASKA REG
GRR	GRAND RAPIDS INTL MI
GSO	GREENSBORO/PIEDMONT NC
GSP	GREENVILLE-SPARTANBU
GTF	GREAT FALLS INTL
GXY	GREELEY/WELD (AWOS) CO
GYR	PHOENIX-GOODYEAR MUN
GYV	GARY REGIONAL
HDO	HONDO MUNICIPAL TX
HEF	MANASSAS MUNI (AWOS) VA
HFD	HARTFORD/BRAINARD CT
HGR	WASHINGTON COUNTY RE
HHR	HAWTHORNE MUNICIPAL CA
HIO	PORTLAND/HILLSBORO OR
HLG	WHEELING OHIO CO
HLN	HELENA REGIONAL
HNL	HONOLULU INTL
HNL	HONOLULU INTL/OAHU HI
HOB	LEA COUNTY/HOBBS/
HOU	HOUSTON/WILL HOBBY TX
HPN	WHITE PLAINS NY
HRL	VALLEY INTL
HSV	HUNTSVILLE INTL-CARL
HTS	TRI-STATE/MILTON J.F

Code	Airport
HUF	HULMAN REGIONAL
HUM	HOUMA-TERREBONNE
HUT	HUTCHINSON MUNI
HVN	TWEED-NEW HAVEN
HWD	HAYWARD AIR TERM CA
HWO	HOLLYWOOD/N. PERRY FL
HYA	HYANNIS/POLANDO FLD MA
IAB	MCCONNELL AFB KS
IAD	WASHINGTON/DULLES VA
IAG	NIAGARA FALLS INTL NY
IAH	HOUSTON/INTERCONTIN TX
ICT	WICHITA/CONTINE (AW) KS
IDA	FANNING FIELD
ILG	WILMINGTON AIRPORT DE
ILM	NEW HANOVER INTERNAT
IND	INDIANAPOLIS INTL IN
INT	SMITH REYNOLDS
IPT	WILLIAMSPORT-LYCOMIN
ISO	KINSTON REGIONAL JET
ISP	ISLIP/MACARTHUR NY
MCF	MACDILL AFB/TAMPA FL
ITH	TOMPKINS COUNTY
ITO	HILO INTERNATIONAL
IWA	WILLIAMS AFB/CHANDL AZ
JAN	JACKSON/THOMPSON MS
JAX	JACKSONVILLE INTL FL
JBR	JONESBORO MUNICIPAL AR
JFK	NEW YORK/JF KENNEDY NY
JLN	JOPLIN REGIONAL
JNU	JUNEAU INTL
JVL	ROCK COUNTY
JXN	JACKSON COUNTY-REYNO
JYO	LEESBURG/GODFREY VA
KOA	KONA INTERNATIONAL K
KWA	BUCHOLZ AAF (KWAJALEI
LAF	LAFAYETTE/PURDUE U IN
LAL	LAKELAND REGIONAL FL
LAN	LANSING/CAPITAL MI
LAS	LAS VEGAS/MCCARRAN NV
LAW	LAWTON - FORT SILL R
LAX	LOS ANGELES INTL CA
LBB	LUBBOCK INTL ARPT TX
LCH	LAKE CHARLES REGIONA
LCK	RICKENBACKER ANGB OH

Table C-1: Airports (Cont'd)

Code	Airport
LEB	LEBANON MUNI
LEX	LEXINGTON/BLUEGRASS KY
LFI	LANGLEY AFB/HAMPTON VA
LFT	LAFAYETTE REGIONAL LA
LGA	NEW YORK/LA GUARDIA NY
LGB	LONG BEACH AIRPORT CA
LIH	LIHUE
LIT	LITTLE ROCK/ADAMS & AR
LMT	KLAMATH FALLS INTERN
LNK	LINCOLN MUNICIPAL NE
LNS	LANCASTER PA
LOT	CHICAGO NEXRAD IL
LOU	LOUISVILLE/BOWMAN KY
LRD	LAREDO INTL
LSE	LA CROSSE MUNI
LSV	NELLIS AFB
LUF	LUKE AFB/PHOENIX AZ
LUK	CINCINNATI/LUNKIN OH
LVK	LIVERMORE MUNICIPAL CA
LWB	GREENBRIER VALLEY
LWM	LAWRENCE MUNICIPAL MA
LWS	LEWISTON-NEZ PERCE C
LYH	LYNCHBURG REGIONAL
MAF	MIDLAND REGIONAL TX
MBS	TRI CITY INTERNATIONAL
MCI	KANSAS CITY INTL MO
MCN	MIDDLE GEORGIA REGIO
MCO	ORLANDO JETPORT & FL
MDH	SOUTHERN ILLINOIS
MDT	HARRISBURG INTERNATI
MDW	CHICAGO/MIDWAY IL
MEI	KEY FIELD
MEM	MEMPHIS INTL ARPT TN
MFD	MANSFIELD LAHM MUNI
MFE	MC ALLEN MILLER INTL
MFR	MEDFORD-JACKSON COUN
MGE	DOBBINS AFB/MARIETT GA
MGM	MONTGOMERY RGNL
MGW	MORGANTOWN MUNI-WALT
MHT	MANCHESTER
MHV	MOJAVE
MIA	MIAMI INTL AIRPORT FL
MIC	MINNEAPOLIS/CRYSTAL MN
MIE	DELAWARE COUNTY-JOHN

Code	Airport
MIV	MILLVILLE MUNICIPAL NJ
MKC	KANSAS CITY MUNI & MO
MKE	MILWAUKEE/MITCHELL WI
MKG	MUSKEGON COUNTY
MKK	MOLOKAI
MKL	MC KELLAR-SIPES REGI
MLB	MELBOURNE REGIONAL FL
MLC	MC ALESTER REGIONAL
MLI	QUAD-CITY
MLU	MONROE REGIONAL
MMU	MORRISTOWN MUNI NJ
MOB	MOBILE/BATES FIELD AL
MOD	MODESTO CITY-COUNTY
MOT	MINOT INTL
MQY	SMYRNA TN
MRI	MERRILL FIELD
MRY	MONTEREY PENINSULA CA
MSN	MADISON/DANE RGNL WI
MSO	MISSOULA INTERNATIONAL
MSP	MINNEAPOLIS-ST PAUL MN
MSY	NEW ORLEANS/MOISANT LA
MTN	BALTIMORE/MARTIN MD
MVY	MARTHAS VINEYARD
MWA	WILLIAMSON COUNTY RE
MWC	LAWRENCE J TIMMERMAN
MWH	MOSES LAKE/GRANT CO WA
MYF	SAN DIEGO/MONTGOMER CA
MYR	MYRTLE BEACH JETPORT
NEW	NEW ORLEANS/LAKEFRO LA
NMM	MERIDIAN NAS /MC CAI
OAK	OAKLAND CA
OGD	OGDEN-HINCKLEY MUNI UT
OGG	KAHULUI
OJC	OLATHE/JOHNSON CO. KS
OKC	OKLAHOMA CITY (AWOS) OK
OLM	OLYMPIA
OMA	OMAHA/EPPLEY FIELD & NE
ONT	ONTARIO INTL ARPT CA
OPF	MIAMI/OPA LOCKA FL
ORD	CHICAGO/O'HARE ARPT IL
ORF	NORFOLK INTL ARPT VA
ORH	WORCESTER MUNI
ORL	ORLANDO/HERNDON & FL
OSC	OSCODA - Wordsmith

Table C-1: Airports (Cont'd)

Code	Airport
OSH	OSHKOSH/WITTMAN FLD WI
OSU	OHIO ST U/COLUMBUS OH
OUN	NORMAN/WESTHEIMER & OK
OWB	OWENSBORO-DAVIESS CO
OWD	NORWOOD MEMORIAL MA
OXC	OXFORD (AWOS) CT
OXR	OXNARD CA
PAE	EVERETT/PAINE FIELD WA
PAH	BARKLEY REGIONAL
PAM	TYNDALL AFB FL
PAO	PALO ALTO AIRPORT CA
PBI	WEST PALM BEACH FL
PDK	ATLANTA/DEKALB GA
PDT	EASTERN OREGON REGIO
PDX	PORTLAND INTL ARPT OR
PFN	PANAMA CITY/BAY CO. FL
PHF	NEWPORT NEWS VA
PHL	PHILADELPHIA INTL PA
PHX	PHOENIX/SKY HARBOR AZ
PIA	GREATER PEORIA REGIO
PIB	PINE BELT RGNL AWOS MS
PIE	SAINT PETERSBURG FL
PIH	POCATELLO REGIONAL
PIT	PITTSBURGH INTL PA
PKB	WOOD COUNTY AIRPORT
PMD	PALMDALE PRODN FLT
PMP	POMPAÑO BEACH FL
PNE	PHILADELPHIA NE PA
PNS	PENSACOLA REGIONAL & FL
POB	POPE AFB NC
POC	LA VERNE/BRACKETT CA
POE	FORT POLK (ARMY) LA
POU	POUGHKEEPSIE NY
PPG	PAGO INTERNATIO
PRC	PRESCOTT/LOVE FLD & AZ
PSC	TRI-CITIES
PSP	PALM SPRINGS RGNL CA
PTK	PONTIAC-OAKLAND MI
PUB	PUEBLO MEMORIAL
PVC	PROVINCETOWN (AWOS) MA
PVD	PROVIDENCE/GREEN RI
PVU	PROVO MUNI (AWOS) UT
PWA	OKLAHOMA CITY/WILEY OK
PWK	CHICAGO/PALWAUKEE IL

Code	Airport
PWM	PORTLAND INTL JET ME
PWT	BREMERTON NTNL AWOS WA
RAL	RIVERSIDE MUNICIPAL CA
RAP	RAPID CITY REGIONAL
RBD	REDBIRD
RDD	REDDING MUNICIPAL & CA
RDG	READING/SPAATZ FLD & PA
RDM	ROBERTS FIELD
RDU	RALEIGH-DURHAM NC
RFD	ROCKFORD IL
RHV	SAN JOSE/REID/HILLV CA
RIC	RICHMOND/BYRD FIELD VA
RME	GRIFFISS AFB
RMG	ROME/RUSSELL (RAMOS) GA
RNO	RENO/CANNON INTL NV
RNT	RENTON MUNICIPAL WA
ROA	ROANOKE MUNICIPAL VA
ROC	ROCHESTER/MONROE CO NY
ROG	ROGERS (AWOS) AR
ROW	ROSWELL/INDUSTRIAL NM
RST	ROCHESTER MUNI
RSW	SOUTHWEST FLORIDA IN
RVS	TULSA/LLOYD JONES OK
SAC	SACRAMENTO/EXECUTIV CA
SAF	SANTA FE CO. MUNI NM
SAN	SAN DIEGO/LINDBERG & CA
SAT	SAN ANTONIO INTL TX
SAV	SAVANNAH MUNICIPAL GA
SBA	SANTA BARBARA MUNI CA
SBN	MICHIANA RGNL TRANSP
SBP	SAN LUIS OBISPO CA
SBY	SALISBURY REGIONAL MD
SCK	STOCKTON METRO CA
SDF	LOUISVILLE/STANDIFO KY
SDL	SCOTTSDALE MUNI AZ
SDM	SAN DIEGO/BROWN FLD CA
SEA	SEATTLE-TACOMA INTL WA
SEE	SAN DIEGO/GILLESPIE CA
SFB	SANFORD/ORLANDO FL
SFF	FELTS FIELD
SFO	SAN FRANCISCO INTL CA
SGF	SPRINGFLD MUNI (AWS) MO
SGT	STUTTGART (AWOS) AR
SHV	SHREVEPORT REGIONAL

Table C-1: Airports (Cont'd)

Code	Airport
SJC	SAN JOSE INTL ARPT CA
SJT	MATHIS FIELD
SLC	SALT LAKE CITY INTL UT
SLE	MCNARY FLD
SLN	SALINA MUNI
SMF	SACRAMENTO METRO CA
SMO	SANTA MONICA MUNI CA
SMX	SANTA MARIA PUB/CAPT
SNA	SANTA ANA/JON-WAYNE CA
SNS	SALINAS MUNI
SPG	SAINT PETERSBURG FL
SPI	SPRINGFIELD/CAPITAL IL
SQL	SAN CARLOS AIRPORT CA
SRQ	SARASOTA-BRADENTON FL
SSC	SHAW AFB/SUMTER SC
SSF	STINSON MUNI
STJ	ROSECRANS MEMORIAL
STL	ST. LOUIS/LAMBERT MO
STP	SAINT PAUL DOWNTOWN MN
STS	SANTA ROSA (AWOS) CA
SUA	WITHAM FIELD
SUN	FRIEDMAN MEMORIAL
SUS	SPIRIT OF ST LOUIS MO
SUX	SIOUX GATEWAY
SWF	NEWBURGH/STEWART NY
SWO	STILLWATER MUNI OK
SYR	SYRACUSE/HANCOCK NY
TCL	TUSCALOOSA MUNI AIRP
TEB	TETERBORO AIRPORT NJ
TIW	TACOMA NARROWS WA
TIX	TITUSVILLE FL
TLH	TALLAHASSEE RGNL FL
TMB	MIAMI/KENDALL-TAMIA FL

Code	Airport
TOA	TORRANCE MUNICIPAL CA
TOL	TOLEDO EXPRESS OH
TOP	PHILIP BILLARD MUNI
TPA	TAMPA INTL AIRPORT FL
TRI	TRI-CITY REGIONAL
TTD	PORTLAND/TROUTDALE OR
TTN	TRENTON/MERCER CO. NJ
TUL	TULSA INTL ARPT (AW) OK
TUS	TUCSON INTL AIRPORT AZ
TVC	TRAVERSE CITY/CHERR MI
TVL	LAKE TAHOE
TWF	TWIN FALLS-SUN VALLE
TXK	TEXARKANA REGIONAL-W
TYR	TYLER/POUNDS FLD TX
TYS	KNOXVILLE MUNICIPAL TN
UCA	ONEIDA COUNTY
UGN	CHICAGO/WAUKEGAN IL
VBG	VANDENBERG AFB AIRPO
VIS	VISALIA MUNI (AWOS) CA
VLD	VALDOSTA REGIONAL
VNY	VAN NUYS AIRPORT CA
VPS	EGLIN AFB/VALPARAIS FL
VRB	VERO BEACH MUNI FL
WDG	ENID WOODRING MUNI
WHP	WHITEMAN
WJF	LANCASTER/FOX FIELD CA
YIP	DETROIT/WILLOW RUN MI
YKM	YAKIMA AIR TERMINAL
YNG	YOUNGSTOWN MUNI OH
YUM	YUMA INTL AIRPORT AZ